

User's Manual**Digital Quick Response Thermometer****GMH 3210**

For Thermocouple Probes Type J, K, N, S, T
as for Version 1.0



WEEE-Reg.-Nr. DE 93889386

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1 General Note

Read this document carefully and get used to the operation of the device before you use it. Keep this document within easy reach near the device for consulting in case of doubt.

Mounting, start-up, operating, maintenance and removing from operation must be done by qualified, specially trained staff that have carefully read and understood this manual before starting any work.

The manufacturer will assume no liability or warranty in case of usage for other purpose than the intended one, ignoring this manual, operating by unqualified staff as well as unauthorized modifications to the device.

The manufacturer is not liable for any costs or damages incurred at the user or third parties because of the usage or application of this device, in particular in case of improper use of the device, misuse or malfunction of the connection or of the device.

The manufacturer is not liable for misprints.

2 Safety

2.1 Intended Use

The safety requirements (see below) have to be observed.

The device must be used only according to its intended purpose and under suitable conditions.

Use the device carefully and according to its technical data (do not throw it, strike it, ...)

Protect the device from dirt.

2.2 Safety signs and symbols

Warnings are labeled in this document with the followings signs:



Caution! This symbol warns of imminent danger, death, serious injuries and significant damage to property at non-observance.



Attention! This symbol warns of possible dangers or dangerous situations which can provoke damage to the device or environment at non-observance.







Note! This symbol point out processes which can indirectly influence operation or provoke unforeseen reactions at non-observance.

2.3 Safety guidelines

This device has been designed and tested in accordance with the safety regulations for electronic devices. However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under "Specification".

If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.

2.  If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.
Operator safety may be a risk if:
- there is visible damage to the device
 - the device is not working as specified
 - the device has been stored under unsuitable conditions for a longer time.
- In case of doubt, please return device to manufacturer for repair or maintenance.
3. When connecting the device to other devices the connection has to be designed most thoroughly as internal connections in third-party devices (e.g. connection GND with protective earth) may lead to undesired voltage potentials that can lead to malfunctions or destroying of the device and the connected devices.
-  This device must not be run with a defective or damaged power supply unit.
Danger to life due to electrical shock!
4.  Do not use these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury or material damage.
Failure to comply with these instructions could result in death or serious injury and material damage.
5.  This device must not be used at potentially explosive areas! The usage of this device at potentially explosive areas increases danger of deflagration, explosion or fire due to sparking.

3 Product Specification

3.1 Scope of supply

The scope of supply includes:

- Device, incl. 9V battery block
- Operation manual

3.2 Operation and maintenance advice

• Battery operation:

If 'bAt' is shown in the lower display the battery has been used up and needs to be replaced. However, the device will operate correctly for a certain time. If 'bAt' is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up. Battery change: p.r.t. chapter



The battery has to be taken out, when storing device above 50 °C.

We recommend taking out battery if device is not used for a longer period of time.

After recommissioning the real-time clock has to be set again.

• Mains operation with power supply



When using a power supply please note that operating voltage has to be 10.5 to 12 V DC.

Do not apply overvoltage!! Cheap 12V-power supplies often have excessive no-load voltage.

We, therefore, recommend using regulated voltage power supplies.

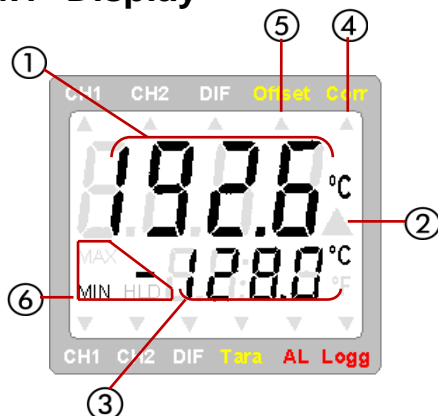
Trouble-free operation is guaranteed by our power supply GNG10/3000.

Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.

- Treat device and sensor carefully. Use only in accordance with above specification. (do not throw, hit against etc.). Protect plug and socket from soiling.
- To disconnect thermocouple sensor plug do not pull at the cable but at the plug.
- **Selection of types of thermocouples:** Prior to carrying out a measurement make sure to check if device is set to the thermocouple type used (type is shown on the display shortly after unit has been switched on). Unless the correct thermocouple is set, temperature measurements will be incorrect!

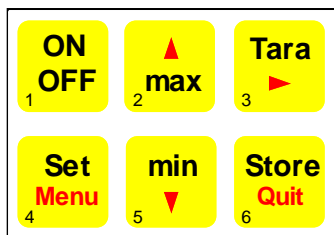
4 Handling

4.1 Display



- | | |
|---|---|
| 1 | Main display: Currently measured temperature |
| 2 | Warnind triangle: indicates a low battery |
| 3 | Secondary display: Display of min, max or hold values |
| 4 | Corr-arrow: indicates that correction factor is activated |
| 5 | Offset-arrow: indicates that zero point offset (offset) is activated. |
| 6 | Min/Max/Hold: shows if a min., max. or hold value is displayed in the secondary display. |

4.2 Basic Operation



On/Off key



min/max when taking measures:

- | | |
|---------------|---------------------------|
| press short: | shows the min./max. value |
| press again: | hides min./max. value |
| press 2 sec.: | clears particular value |



Tara: no function



Set/Menu:

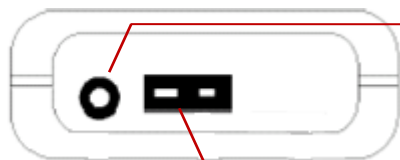
- | | |
|--------------|----------------------------|
| press short: | invokes configuration menu |
|--------------|----------------------------|



Store/Quit:

- | | |
|--------------|--|
| press short: | hold-function, the last measuring value will be held in the secondary display. |
| | Set/Menu: Acknowledge setting, return to measuring. |

4.3 Connections



Output: Connection for optically isolated interface adapter or for analog output (please refer to chapter 8)

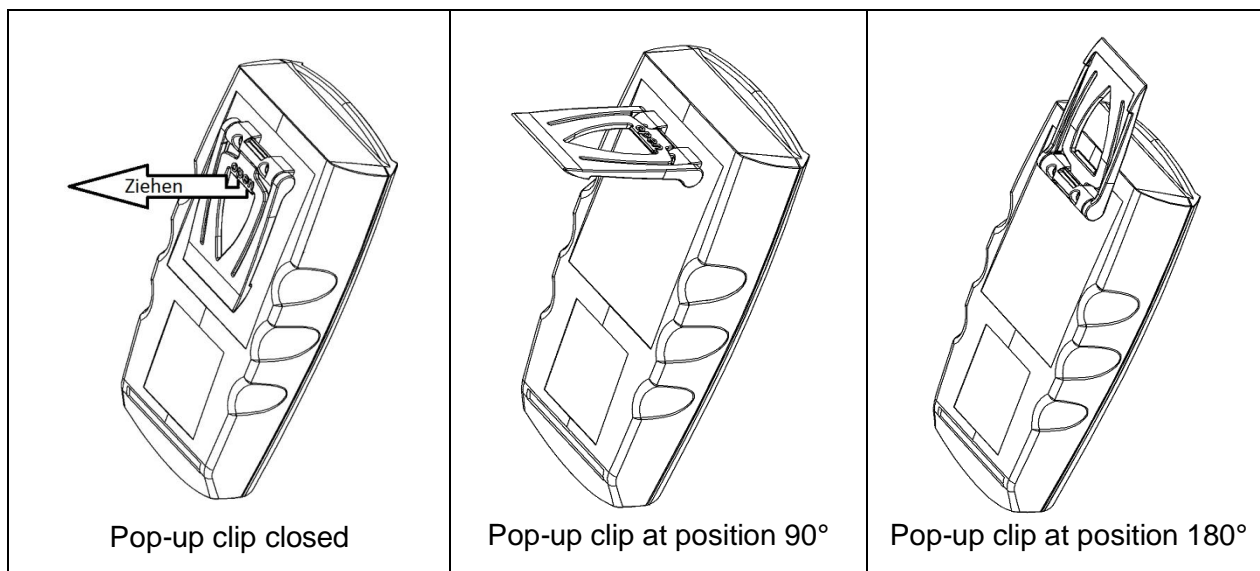
Probe connection

Power supply: the mains adapter socket is located at the left side of the device.

4.4 Pop-up clip

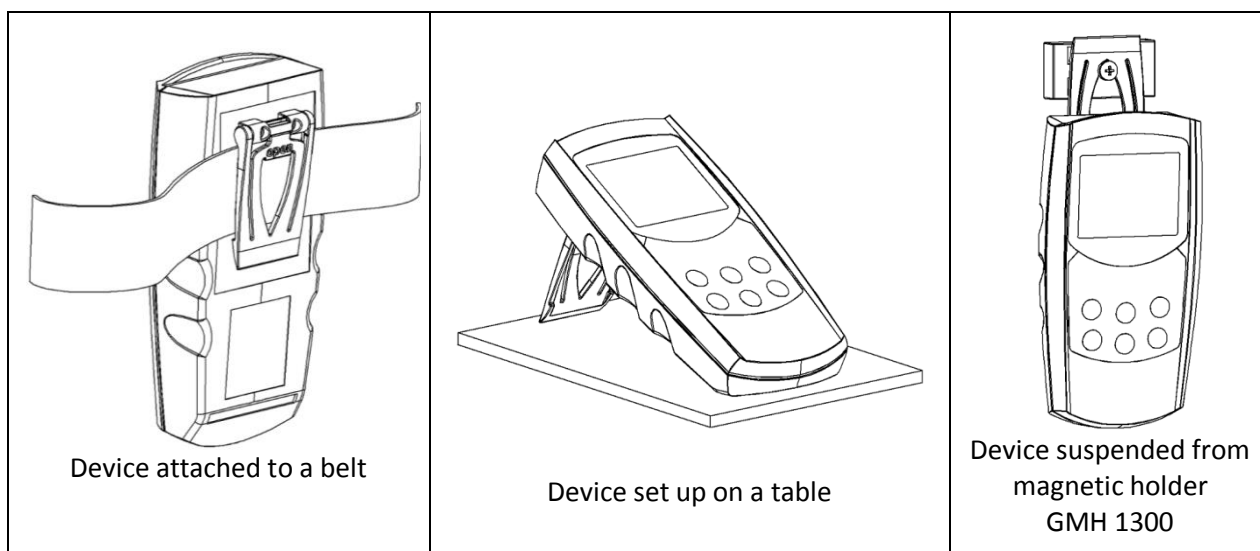
Handling:

- Pull at label “open” in order to swing open the pop-up clip.
- Pull at label “open” again to swing open the pop-up clip further.




Function:

- The device with a closed pop-up clip can be plainly laid onto a table or attached to a belt, etc.
- The device with pop-up clip at position 90° can be set up on a table, etc.
- The device with pop-up clip at position 180° can be suspended from a screw or the magnetic holder GMH 1300.



5 Start Operation

Connect sensor, turn on device via  key.



After segment test the device displays some configuration:

- If a **zero point adjustment** was carried out the display shows shortly „nuLL Corr“.

After that the device is ready for measuring.











6 Configuration

To change device settings, press **Menu** (key 4) for 2 seconds. This will call the configuration menu.

Pressing key **Menu** jumps between the parameters.

The parameters can be changed with \blacktriangle (key 2) or \blacktriangledown (key 5).

Quit (key 6) finishes the configuration and returns to standard measuring operation.

Parameter	Values	Description
„Menu“	\blacktriangle or \blacktriangledown	
	ni.cr , n , s , t , J	Type: Selection of the Thermocouple-Type ni.cr: type K, NiCr-Ni n: type N, NiCrSi-NiSi s: type S, Pt10Rh-Pt t: type T, Cu-CuNi J: type J, Fe-CuNi
	°C, °F	Unit: Selection of Temperature Unit
	1°C, 0.1°C, Auto	Resolution: Selection of Display Resolution (Not for Type S) Attention: When Type S is selected the resolution is always 1°C!
	0.950...1.200	Display correction factor (refer to chapter 9.2)
	off	Factor deactivated (=1.000)
	1 ... 120	Auto Power-Off time in minutes
	oFF	Auto Power-Off deactivated
	01, 11 ... 91	Base address of interface
	-10°C...10°C bzw. -18°F...18°F	The offset of sensor will be displaced by this value to compensate for deviations in the probe or in the measuring device.
	oFF	Zero displacement inactive (=0.00)
	SEr, dAC	Output: function of device output: serial interface or analogue output
	oFF	No output function, lowest power consumption
	-220°C...1372°C	Output Offset when output = Analogue output (depending on selected range) Input of the temperature at which 0V should be output
	-220°C...1372°C	Output grade when output = Analogue Output (depending on selected range) Input of the temperature at which 1V should be output

7 Remarks to Special Functions

7.1 Display Resolution

Standard setting: 'Auto', i.e. the device automatically switches over to the optimum resolution between 1° and 0.1°.

If temperatures to be measured are near the switching threshold, a fixed resolution may be better, e.g. for easy recording. In such a case please select the optimum resolution manually.

Independent from this setting, type S measurings are always in 1° resolution!

7.2 Power off Time

If there won't be pressed any key and no interface communication takes place for the time of the power off time setting (P.Off), the device will be switched off automatically to save battery power.

If P.oFF = oFF then the automatic switch off is deactivated.

7.3 Min-/Max-value memory, Hold function

• **Min-/Max-value memory:** the max. and the min. value will be memorised.

• **Hold function:** Press button 6 to store current value.

For more Information please refer to chapter 4.2

8 Output

The output can be used as serial interface (for USB 3100, USB 3100 N, GRS 3100 or GRS 3105 interface adapters) or as analog output (0-1V).

If none of both is needed, we suggest to switch the output off, because battery life then is extended.

8.1 Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (USB 3100, USB 3100 N, GRS 3100 or GRS 3105) the device can be connected to a computer for data transfer.

With the GRS 3105 up to 5 devices of the GMH3xxx- series can be connected to one interface (see also manual of GRS 3105). As a precondition the base addresses of all devices must not be identical, make sure to configure the base addresses accordingly (refer menu point "Adr." in chapter 6).

To avoid transmission errors, there are several security checks implemented e.g. CRC.

The following standard software packages are available:

- **GMHKonfig:** Software for a comfortable editing of the device (e.g. Material selection...)
- **EBS 20M / 60M:** 20-/60-channel software to display the measuring values

In case you want to develop your own software we offer a **GMH3000-development package** including:

- a universally applicable Windows functions library ('GMH3000.DLL') with documentation that can be used by the most programming languages. Suitable for Windows XP™, Windows Vista™, Windows 7™
- Programming examples Visual Basic 4.0™, Delphi 1.0™, Testpoint™

Note: *The measuring and range values read via interface are always in the selected display unit (°C/°F)!*

Supported interface functions:

Code	Name/Function	Code	Name/Function
0	Read nominal value	201	Read max. display range
3	Read system status	202	Read unit of display
6	Read min. value	204	Read decimal point of display
7	Read max. value	208	Read channel count
12	Read ID-no.	216	Read offset correction
174	Delete min. value	217	Set offset correction
175	Delete max. value	218	Read corr. Factor (950..1200)
194	Set display unit	219	Set corr. factor (950..1200)
195	Set decimal point in display (255=Auto)	240	Reset
199	Read meas. type in display	254	Read program identification
200	Read min. display range		

8.2 Analogue Output – Scaling with DAC.0 and DAC.1

Note: Analogue output can not be used during logger recordings

With the DAC.0 and DAC.1 values the output can be rapidly scaled to your efforts.

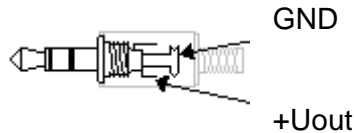
Keep in mind not to connect low-resistive loads to the output, otherwise the output value will be wrong and battery life is decreased. Loads above ca 10kOhm are uncritical.

If the display exceeds the value set by DAC.1, then the device will apply 1V to the output

If the display falls below the value set by DAC.0, then the device will apply 0V to the output

In case of an error (Err.1, Err.2, no sensor, etc.) the device will apply slightly above 1V to the output.

plug wiring:



Attention!

the 3rd contact has to be left floating!
Only stereo plugs are allowed!

9 Input Adjustment

9.1 Zero Displacement ('Offset')

A zero displacement can be carried out for the measured temperature:

$$\text{temperature displayed} = \text{temperature measured} - \text{offset}$$

Standard setting: 'off' = 0.0°, i.e. no zero displacement will be carried out. The zero displacement is mainly used to

compensate for sensor deviations. Unless 'off' is set, this value will be displayed shortly after the device is switched on;

during operation it will be identified by means of the offset arrow in the display.

9.2 Display Correction Factor ('Corr')

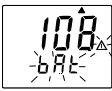

This factor is used to compensate for losses of transfer in case of surface measurements, occurring if the object to be measured is extremely hot but will be cooled by lower ambient temperatures. The same can be true for sensors with a large mass. Unless 'off' is set (standard setting: 'off' = 1.000), this value will be displayed shortly after the device is switched on; during operation it will be identified by means of the Corr-arrow in the display.

$$\begin{aligned} \text{temperature displayed [}^{\circ}\text{C]} &= \text{temperature measured [}^{\circ}\text{C]} * \text{Corr} \\ \text{or temperature displayed [}^{\circ}\text{F]} &= (\text{temperature measured [}^{\circ}\text{F]} - 32^{\circ}\text{F}) * \text{Corr} + 32^{\circ}\text{F} \end{aligned}$$


10 Basics of Thermocouple Temperature Measurements

- The right thermocouple type has to be selected prior to measuring (p.r.t. Device Configuration). Otherwise the instrument will display a wrong value! The device is optimised for type K usage.
- Temperature differences between the instrument and the probe connector may produce measuring errors, especially when using other types than type K. Therefore wait after connecting or touching the connector until the temperatures have adjusted (can take several minutes, depending on the temperature differences).
- The device is suitable to measure large temperature ranges. But consider the allowable range of the probe!
- When measuring air temperature the probe has to be dry. Otherwise the cold due to the evaporation causes too low measurements.

11 Error And System Messages

Display	Meaning	Remedy
	low battery voltage, device will continue to work for a short time	replace battery
	If mains operation: wrong voltage	replace power supply, if fault continues to exist: device damaged
	low battery voltage	replace battery
	If mains operation: wrong voltage	Check/replace power supply, if fault continues to exist: device damaged
No display or weird display Device does not react on keypress	low battery voltage	replace battery
	If mains operation: wrong voltage	Check/replace power supply, if fault continues to exist: device damaged
	system error	Disconnect battery or power supply, wait some time, re-connect
	device defective	return to manufacturer for repair
SenS Erro	Sensor error: no sensor connected	Connect sensor to socket
	sensor/cable or device defective	return to manufacturer for repair
Err.1	Value exceeding measuring range	Check: Is the value exceeding the measuring range specified? ->temperature too high!
	sensor/cable defective	-> replace
Err.2	Value below display range	Check: Is the value below the measuring range specified? -> temperature too low!
	sensor/cable defective	-> replace
Err.7	system error	return to manufacturer for repair
	Far out of allowable operation temperature	-25..50°C are allowable

12 Specification

Thermocouple:	J, K, N, S or T			
Probe Connection:	Socket for flat pin plug, free from thermo voltage for type K			
Resolution:	0,1°C or 1°C 0,1°F or 1°F for types J, K, N, T 1°C 1°F for type S			
Meas. Ranges:	0,1°C	1°C	0.1F	1°F
Type K: (NiCr-Ni)	-65,0... +300,0 °C	-220... +1372 °C	-85,0... +572,0 °F	-364... +2500 °F
Type J: (Fe-CuNi)	-50,0... +225,0 °C	-140... +950 °C	-58,0... +437,0 °F	-220... +1742 °F
Type T: (Cu-CuNi)	-65,0... +250,0 °C	-220... +400 °C	-85,0... +482,0 °F	-364... +752 °F
Type N: (NiCrSi-NiSi)	-100,0... +380,0 °C	-200... +1300 °C	-148,0... +716,0 °F	-328... +2372 °F
Type S: (Pt10Rh-Pt)	-	-50... +1768 °C	-	-58... +3214 °F
Accuracy: (for thermocouples DIN EN 60584)	±1 digit (at nominal temperature)			
	Range 0,1 °C/°F	Range 1 °C/°F		
Type K:	±0,03% of m.v. ±0,05%FS	±0,08% of m.v.±0,1%FS		
Type J:	±0,03% of m.v.±0,08%FS	±0,08% of m.v.±0,1%FS		
Type T:	±0,03% of m.v.±0,1%FS	±1°C (T > -100°C), ±1°C ±1Digit (T < -100°C)		
Type N:	±0,03% of m.v.±0,05%FS	±0,08% of m.v.±0,1%FS (T > -100°C) ±1°C, ±0,1%FS (T < -100°C)		
Type S:	-	±0,1% of m.v.±0,1%FS (T > 200°C), ±1°C ±0.1%FS (T<200°C)		
Temperature drift	0,01 %/K			
Point of Comparison	±0,3 °C			
Nominal temperature	25 °C			
Display:	2 four digit LCDs (12.4mm high and 7 mm high) for measuring values, and for min/ max memories, hold function, etc. as well as additional functional arrows.			
Pushbuttons:	6 membrane keys			
Output:	3.5 mm audio plug, stereo			
Output function:	selectable as serial interface or analog output			
Interface:	Serial interface (3.5mm jack) can be connected to USB or RS232 interface of a PC via electrically isolated interface adapter USB3100, USB 3100 N, GRS3100 or GRS3105 (see accessories).			
Analog output:	0 ... 1 Volt, freely scaleable (resolution 12 bit)			
Power supply:	9V battery, type: IEC 6F22 (included in scope of supply) as well as additional d.c. connector (diameter of internal pin 1.9 mm) for external 10.5-12V direct voltage supply.  (suitable power supply: GNG 10 / 3000)			
Power consumption:	approx. 260µA when output switched off approx. 400µA when output is serial interface (at 1 reading per second) approx. 500µA when output is analogue output (without load)			
Low battery warning:	' bAt '			
Working conditions:	-20 ... +50 °C, 0 ... 95 %RH (not condensing)			
Storage temperature:	-20 ... +70 °C			
Housing:	impact-resistant ABS, membrane keyboard, transparent panel, Front side IP65			
Dimensions:	142 x 71 x 26 mm (L x W x D)			
Weight:	approx. 155 g			
EMC:	The device corresponds to the essential protection ratings established in the Regulations of the Council for the Approximation of Legislation for the member countries regarding electromagnetic compatibility (2004/108/EG). Additional fault: <1%			

13 Reshipment and Disposal

13.1 Reshipment



GEFAHR

All devices returned to the manufacturer have to be free of any residual of measuring media and other hazardous substances. Measuring residuals at housing or sensor may be a risk for persons or environment



Use an adequate transport package for reshipment, especially for fully functional devices. Please make sure that the device is protected in the package by enough packing materials.

13.2 Disposal instructions



Batteries must not be disposed in the regular domestic waste but at the designated collecting points.



The device must not be disposed in the unsorted municipal waste! Send the device directly to us (sufficiently stamped), if it should be disposed. We will dispose the device appropriate and environmentally sound.